We claim:

1. A process of making a porous, carbon nanotube-containing structure, comprising:

providing a support material having through-porosity;

depositing seed particles on the support material to form a seeded support material; and

heating the support material and simultaneously exposing the seeded support to a carbon nanotube precursor gas to grow carbon nanotubes on the surface of the seeded support material.

2. The process of claim 1 further comprising the step of forming a surfactant templated solution and depositing the surfactant template solution over the support material.

3. The process of claim 2 wherein a metal oxide layer is deposited on the support before depositing the surfactant template solution.

4. The process of claim 3 wherein the metal oxide layer comprises alumina.

5. The process of claim 4 wherein the alumina layer is applied by chemical vapor depostion.

6. A porous carbon nanotube containing structure comprising:

a large pore support having through porosity; and

carbon nanotubes disposed over the large pore support.

7. The porous carbon nanotube containing structure of claim 6 further comprising a mesoporous silica film disposed between the large pore support and the carbon nanotubes.

8. A heat exchanger comprising the porous carbon nanotube containing structure of claim 6.

9. The heat exchanger of claim 8 comprising at least one microchannel wherein the porous carbon nanotube containing structure of claim 6 is disposed within at least one of said microchannels.

10. A method of making a carbon nanotube containing structure, comprising:
providing a support;
applying a surfactant template composition over the support;
forming a solid, silica-containing layer from the surfactant template composition that adheres to the support; and
growing carbon nanotubes on the silica-containing layer.

11. The method of claim 10 wherein the support is a metal support and the surfactant template composition is dip coated onto the support.

12. The method of claim 11 wherein the support comprises a metal foam.

13. The method of claim 11 further comprising the step of depositing a metal oxide layer on the metal support prior to applying the surfactant template composition.

14. A microchannel heat exchanger comprising:
at least one microchannel; and
carbon nanotubes disposed within at least one of said microchannels.

15. The microchannel heat exchanger of claim 14 comprising the porous carbon nanotube containing structure of claim 6 is disposed within at least one of said microchannels.

16. The microchannel heat exchanger of claim 14 comprising a mesoporous silica film disposed between a microchannel surface and said carbon nanotubes.

17. A filter comprising the structure of claim 6.

18. The structure of claim 6 wherein the large pore support is a honeycomb or metal mesh.

19. A method of adsorbing a chemical component, comprising:

contacting the structure of claim 6 with a chemical component whereby the chemical component is adsorbed on the surface of the structure.

20. A method of adsorbing a chemical component, comprising:

contacting a carbon nanotube-containing structure with a chemical component whereby the chemical component is adsorbed on the surface of the structure;

wherein the carbon nanotube-containing structure comprises a support, carbon nanotubes disposed over the support, and a mesoporous silica layer disposed between the support and the carbon nanotubes.

21. The method of claim 20 wherein the chemical component is hydrogen.

22. The method of claim 21 wherein the carbon nanotube-containing structure further comprises a layer of palladium exposed on the surface.

23. A method of separating a component, comprising:

contacting the structure of claim 6 with a mixture whereby the structure of claim 6 separates at least one component from the mixture.

24. A method of separating a chemical component, comprising:

contacting a carbon nanotube-containing structure with a mixture whereby the structure separates at least one component from the mixture;

wherein the carbon nanotube-containing structure comprises a support, carbon nanotubes disposed over the support, and a mesoporous silica layer disposed between the support and the carbon nanotubes.

25. The method of claim 23 wherein the structure acts as a filter.

26. The method of claim 24 wherein the structure further comprises an ion exchange medium on the surface of the structure and the separation comprises exchanging an ion with at least one component in the mixture.

27. The method of claim 24 wherein the mixture is distilled in the presence of the structure.

28. The method of claim 20 wherein the support has through porosity.

29. The method of claim 24 wherein the support has through porosity.

30. The porous carbon nanotube containing structure of claim 6 further comprising mesoporous silica disposed within the large pores of the support, wherein the mesoporous silica substantially fills the large pores.

31. The method of claim 10 wherein the support is a ceramic support and the surfactant template composition is dip coated onto the support.